

# TRACKS

## STOP THEM IN THEIR

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Yes, it is a good policy that the United States government has set minimum performance standards for original equipment manufacturers (OEM) brake components and systems of new vehicles. It is also a good thing that for the most part, these standards have been homologated or standardized from country to country worldwide so that manufacturers do not have to contend with several different performance standards for each vehicle or product they market.

TRC Inc. can perform all of the OEM-required testing in accordance with:

### Testing Standards:

- FMVSS/CMVSS 105/135 Hydraulic Controls and Warning Elements
- FMVSS/CMVSS 121 Tire selection and Rims
- FMVSS 122/CMVSS Motorcycle Brake Systems

- FMVSS/CMVSS 121 Air Brake Systems
- FMVSS 135/CMVSS Brake Test (non-ABS-equipped vehicles only); including Wheel Lock Sequence and Adhesion Utilization
- ECE R13 Brake Test (ABS-equipped vehicles – dynamic brake stops)
- EEC 71-320 Braking (Passenger Vehicle)
- EEC 93/14 Braking (Motorcycle)
- TRIAS 11-2-1994 (Japanese passenger vehicle brakes)

Vehicles and components tested include: motorcycles, ATV, passenger vehicles, heavy trucks, heavy equipment, golf carts, utility vehicles, construction and agricultural equipment, towed trailers, brake system lubricants, regenerative systems, and components that influence brake performance such as tires, steering and suspension systems. Other components routinely tested include valves and switches. We have also provided test support for accident reconstruction involving brakes and for product demonstrations where manufacturers want to showcase their products to their customers and the press.

The test courses that we use for brake compliance testing are the 7.5 Mile Test Track, the 9,000 ft. Skid Pad, and the Brake Soak Tank.

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*(Stop them in their tracks. . . continued)*

that are used for research, corrosion and performance testing are our huge variety of bumps, chuckholes and dips scattered throughout the proving grounds, NVH surfaces, level and sloped basalt and ceramic tiles, wet and dry dynamic handling courses, sand, gravel, and slippery and abrasive surfaces. Brake-holding tests can now be conducted day and night on our newly illuminated 20 and 30% brake slopes. Other slopes available are 40, 50 and 60% concrete slopes for military-type vehicles. TRC Inc. monitors skid numbers and peak braking coefficient data on our paved surfaces every two weeks. This information provides facility users with information for development and testing of tires and brake systems.

Brake testing is conducted by TRC Inc.'s trained and experienced staff that is available to conduct tests or assist customer-run tests in a timely and accurate manner. Each project is planned and organized according to its unique test requirements. Services include test plan development, test conduct, data analysis and systems modification recommendations.

While we are awaiting the National Highway Traffic Safety Administration's (NHTSA) Notice of Proposed Rulemaking (NPRM) to amend its air-brake standard for medium and heavy vehicles to reduce the stopping distance by 20% to 30%, TRC Inc. can proceed with that testing for both truck and trailer brake systems and materials manufacturers wanting to get ahead of the rush. We are expecting the final rule could occur in March 2008.

While FMVSS and like-type standards do not apply to aftermarket components or systems, TRC Inc. can also help the aftermarket manufacturers perform regulatory-type testing for their products.

## TRC SUPPORTS INDUSTRY EVENTS



*SAE Mini Baja Event*

The 2007 SAE Baja Fall Invitational was held by the Dayton, Ohio Section at TRC Inc. on September 29, 2007. Nearly 300 participants and volunteers representing 26 colleges and universities throughout the United States and Canada made the event a huge success.

Engineering students built off-road vehicles that could survive severe punishment of rough terrain, and SAE chose TRC Inc.'s All-Terrain Vehicle Course, complete with washboards, dirt, logs, hills, and mud pits, for the competition site.

The project involved planning, manufacturing, and introduction of the new product to a fictitious firm. The student teams were required to generate financial support for their projects, as well as design, build, test, promote, and race their vehicles. All the vehicles involved were powered by a ten-horsepower Intek Model 20 engines donated by Briggs & Stratton Corporation.

Winning first place was Auburn University, while Michigan State placed second, and The University of Windsor placed third. The competition was not only a success, but it was an excellent way to kick off the school year and spark excitement in the field of engineering.

formance Testing, at the SAE 2007 Commercial Vehicle Engineering Congress & Exhibition on October 30, 2007, in Rosemont, IL as a part of the **Government/Industry Brake Research, Rulemaking & Technologies session discussing the impending final FMVSS 121 rulemaking.**

### The TIRE SOCIETY

At the Annual Conference on Tire Science & Technology that was held in Akron, OH, in September 2007, Dr. Mohamed Kamel Salaani made two presentations on his papers: Effect of Tire Stiffness on the Articulated Vehicles Understeer Gradient, and Effect of Normal Pressure Distributions on the Analytical Solutions to Tire Forces. TRC Inc.'s Larry Evans made an oral presentation on tire aging: Evaluation of New and Aged Tires by Accelerated Service Life Tests: Comparison Using a Stepped-Up-Load and a Stepped-Up-Speed Road Wheel.

### ESV CONFERENCE

At the previously reported 20th International Technical Conference on the Enhanced Safety of Vehicles, held in June, 2007, in Lyon, France, a paper authored by NHTSA's James MacIsaac, and TRC Inc's Sebastien Feve was presented: NHTSA Tire Aging Test Development Project - Phase I Phoenix, Arizona Tire Study.

### SAE COMVEC CONGRESS

Richard L. Hoover will make an oral presentation, Trailer ABS Per-



## NAME-CALLING IS OK!

I can take it. It really doesn't hurt so much when people call me names, or even when they call my family members *dummies*. In fact, while we may not look exactly alike, even you are somewhat of a distant cousin to my close cousins, Vince and Larry. Fortunately it is impossible to hurt me because I am technically an anthropomorphic test device, used in crash testing, so that injuries to humans during a vehicular crash can be measured on me.

Even though we may appear somewhat underdressed, TRC Inc. makes sure we have the latest fashion updates in our internal components. Our



equipment includes a 16-channel data acquisition system where channels are typically digitized at a rate of 12,500 samples per second.

TRC Inc. can supply dummies for testing they conduct, or you can supply you own for TRC's testing. Dummy equipment available to rent includes:

- Hybrid II 50th (572B) Male
- Hybrid III 50th (572E) Male
- Hybrid III 5th Small Female
- VIP 95th Male
- VIP 5th Female
- SID (572F)
- Hybrid III 3-yr.-old Child
- Hybrid III 6-yr.-old Child
- SID IIs – build-level D
- EUROSID-2re - build-level D
- 6-yr.-old Child (5721)
- 3-yr.-old Child (572C)
- CAMI 6-mo.-old Infant (572D)
- CRABI 12-mo.-old Infant

We are calibrated according to test requirements in accordance with National Highway Traffic Safety Administration, Economic Commission of Europe, and SAE standards using

the following fixtures:

- Pendulum impact station
- Child dummy station
- Head drop fixture
- Hybrid II lumbar and abdominal compression fixtures
- Hybrid III knee test fixture
- SID thoracic shock absorber fixture
- Eurosid rib module test equipment
- Neck pendulum fixture with adaptors for all dummy necks (from the 3-yr.-old to the lateral EUROSID-2re)
- Hybrid III dummy hip flexion fixture.

TRC Inc. can also conduct calibrations on your own test dummies too. You may knock on our heads, but we are honored to be designed to take the hit for you in crash testing! We're happy that our job is making your world a safer place.



## THE WHEELS ON THE BUS GO ROUND AND ROUND!

We are definitely not implying that vehicle testing is child's play! TRC Inc. has extensive bus testing experience for both domestic and foreign manufacturers of shuttle, school, transit and over-the road buses and all types of motorhomes and heavy duty vehicles.

While the customers of TRC Inc. are given assurances that their names and test information will be held confidential, we can tell you that TRC Inc. is a major US government test contractor for Federal Motor Vehicle Safety Standards. The US DOT's Vehicle Research and Test Center is located on-site at TRC Inc. where their research activities includes the evaluation for compliance of vehicles to FMVSS, the upgrading and introduction of new FMVSS

standards, and the assessment of school bus safety with respect to seats and side objects detection. TRC Inc. provides facilities and labor support to accomplish many of those tests. We have also performed impact testing on dozens of school buses for FMVSS fuel tank integrity testing for manufacturers.

Other bus tests that TRC can conduct are in accordance with standards set by SAE, including fuel economy testing. We have also conducted a wide range of brake and durability and performance-type testing over our accelerated durability and gravel test roads and local highways. School bus-specific FMVSS tests we conduct are:

- FMVSS No. 220 - School Bus Rollover Protection: Specifies

performance requirements for school bus rollover protection. This standard increases the structural resistance of school buses in rollover-type accidents. This standard only applies to school buses and covers all styles of school bus.

- FMVSS No. 221 - School Bus Body Joint Strength: Specifies requirements for the strength of the body panel joints in school bus bodies. This standard improves the body strength of school buses through increased strength of the joints between panels that comprise the bus body. Applicable to all school buses with a gross vehicle weight rating in excess of 10,000 pounds.
- FMVSS No. 222 - School Bus Passenger Seating and Crash

Protection: Specifies occupant protection requirements for school bus passenger seating and restraining barriers. This standard provides increased protection to passengers through a series of interior changes known as “compartmentalization”—meaning high-backed, well-padded, and well-constructed seats. This standard only applies to school buses and covers all styles of school bus.

- FMVSS No. 301 - Fuel System Integrity: Specifies requirements for the integrity of motor vehicle fuel systems. Establishes fuel system integrity requirements for school buses over 10,000 pounds gross vehicle weight rating.

Other FMVSS tests TRC Inc. can conduct include:

- FMVSS No. 101 - Controls and Displays
- FMVSS No. 102 - Transmission Shift Lever Sequence, Starter Interlock, and Transmission Brak-

ing Effect

- FMVSS No. 103 - Windshield Defrosting and Defogging Systems
- FMVSS No. 104 - Windshield Wiping and Washing Systems
- FMVSS No. 105 - Hydraulic Brake Systems
- FMVSS No. 111 - Rearview Mirror
- FMVSS No. 113 - Hood Latch System
- FMVSS No. 120 - Tire Selection and Rims for Motor Vehicles Other Than Pass Cars
- FMVSS No. 121 - Air Brake Systems
- FMVSS No. 124 - Accelerator Control Systems
- FMVSS No. 131 - School Bus Pedestrian Safety Devices
- FMVSS No. 201 - Occupant Protection in Interior Impact
- FMVSS No. 202 - Head Restraints
- FMVSS No. 203 - Impact Protection for the Driver from the Steering Control System

- FMVSS No. 204 - Steering Control Rearward Displacement
- FMVSS No. 207 - Seating Systems
- FMVSS No. 208 - Occupant Crash Protection
- FMVSS No. 210 - Seat Belt Anchorages
- FMVSS No. 212 - Windshield Mounting
- FMVSS No. 214 - Side Door Strength
- FMVSS No. 217 - Bus Emergency Exits and Window Retention and Release
- FMVSS No. 219 - Windshield Zone Intrusion
- FMVSS No. 301 - Fuel System Integrity
- FMVSS No. 303 - Fuel System Integrity of Compressed Natural Gas Vehicles
- FMVSS No. 304 - Compressed Natural Gas Fuel Container Integrity



## TWO OF A KIND



*Paved Rough Road Construction*

Two are better than one! We like our Paved Rough Road (PRR) so much, we decided to build another. Construction crews worked vigorously over the hot summer months to hand sculpt an identical replica of the PRR we have now. The \$1.4 million course will not only be an excellent addition to our numerous ride quality and accelerated bump courses, but it will also provide opportunity for

more customer testing.

The PRR courses are ideal for durability testing of passenger cars and sport utility vehicles. The two identical courses are side-by-side, with an offset of about 60 feet. The courses are comprised of 855 feet of light duty and 1,215 of medium duty concrete bumps, embedded in a 4,200 foot asphalt roadway.

The bumps are random and do not mimic any specific roads; however, the surfaces are dynamite on car suspension components.

With the additional PRR and the numerous ride quality and accelerated bump courses, TRC Inc. can help you get the attention your ride control products need. With real life input, from people and roads, we can help you evaluate ride, vibration, noise, and suspension control management systems like vibration control components, springs, shocks absorbers, struts, chassis, powertrain, and load assist products. Several miles of courses are available with chuckholes, sine waves, unsprung mass vibration strips, Belgian blocks, cobblestones, boulders, drains, road joints, undulations, positive and negative shocks, tar and chip, and rumble grooves, in order to expose almost every part of a vehicle to some kind of vibration control.

